

Amendments to the Specification:

Please replace paragraph [0009] with the following amended paragraph:

[0009] U.S. Patent number 6,094,850 utilizes an illuminated report at the very last portion of the load were it doesn't aid the user as a trailing signalization in the process of depletion of the ammunition load[[.]] and requires a complex mechanical assembly to detect the process of ammunition expenditure.

Please replace paragraph [0011] with the following amended paragraph:

[0011] U.S. Patent # 5,406,730 discloses detecting means including sound and also inertial switch event reports to the tracking means, and the display is also numerical and mounted on the grip and Patent # 6,643,968 discloses a pistol also with a dual event detecting means built specifically into the weapon frame, based on said frame undergoing distortion, [[and]] it is aimed only for usage record keeping [[.]], and does not include a per load tracking capability.

Please replace paragraph [0012] with the following amended paragraph:

[0012] All of the abovementioned are in one or another way different and less practical to [[adapt]] be retrofitted into [[to a]] an existing weapon, as it will be disclosed in this application.

Please replace paragraph [0016] with the following amended paragraph:

[0016] This application is in part [[a further]] an advanced detecting and tracking assembly and method [[form]] supporting [[ef]] the Low Ammunition Warning System portion disclosed on said application and additionally an event time and date recording assembly.

Please replace paragraph [0018] with the following amended paragraph:

[0018] This invention refers to a monitoring system for firearms, including [[a tracking device]] an assembly and a method for detecting ammunition has been discharged from a load carried by said weapon [[more specifically for a weapon usage tracking device and a method,]] that utilizes a battery operated microprocessor or microcontroller based programmable [[controller circuitry]] assembly [[, and could be used in combination either with a]] including a per load depletion [[process warning]] monitoring system [[which in turn comprises a method for signalizing]] with provisions to enable signals to the user [[of the]] regarding the depletion process of said load of ammunition, or provisions for [[a]] time and date event [[recorder]] recording or a combination of both provisions sharing substantially the same monitoring structure.

Please replace paragraph [0019] with the following amended paragraph:

[0019] When operating an automatic or semiautomatic weapon, several [[typical]] events can take place.

Please replace paragraph [0020] with the following amended paragraph:

[0020] Asides from placing a loaded clip and removing a spent one, [[a trigger is pulled, the slide is displaced, an empty shell is ejected, a new round is chambered, etc.]] and manually chambering a new round, etc., in the operation of a weapon, there are cyclic events inherent to the actual discharging and automatic reloading of a round that are typical to each type of weapon.

Please replace paragraph [0021] with the following amended paragraph:

[0021] [[Some of these events take place when discharging the weapon and can also be

~~executed manually by the user. A user can pull and release the slide, can dry fire the trigger, can pull the slide and leave it open, etc.]~~

These cyclic events are dynamic in nature and involve weapon mechanical components that are abruptly urged to displace, collide, change direction or arrive to a rest position, etc., driven by certain amount of energy, which is originally derived of the explosive content of the actual round being discharged.

Please add the following new paragraphs after paragraph [0021]:

[0021.1] The components that are actuated, vary somewhat according to weapon designs and substantially according to weapon type, nonetheless, a cycle of dynamics of discharge and reload is always present, with different duration, different amounts of energy, different mechanical structures being involved, but always present and their duration is linked to the weapon net rate of fire. By properly coupling an adequate form of detecting means adapted to generate electrical impulses from dynamic stresses induced unto said detecting means by said weapon's activity, sets of pulses representative of the dynamic cyclic events taking place while discharging or discharging and reloading of a round could be tracked. Furthermore, by understanding the nature and the physical properties of the typical cycle of the dynamic mechanical activity of the weapon in which this is adapted, the electrical pulse sets generated as described, could be logically interpreted as representative of particular activity, subsequently correlated, and said information used for tracking purposes.

Please replace paragraph [0022] with the following amended paragraph:

[0022] For [[correctly determining]] making the correct determination of what has happened with a useful degree of accuracy in order to perform a tracking operation, several provisions have to be implemented. First and foremost, there has to be in place a way of detecting an event with provisions for tracking and discriminating [[said]] one event from

being another.

Please delete paragraph [0023].

Please replace paragraph [0024] with the following amended paragraph:

[0024] [[By]] After properly determining the nature of the detected information, preprogrammed activity such as reporting a signal or data recording, could then be executed with a substantial degree of certainty.

Please delete paragraph [0025].

Please add the following new paragraphs after paragraph [0025]:

[0025.1] The possibility that by the use of an adequately adapted detecting means in combination with a tracking structure having substantial provisions to identify if a round has been discharged and reloaded automatically, if the round just discharged was the last one of that particular load or if a round has just been chambered, provides great advantage for correctly recording real time events and reporting to the user, of a load of ammunition depletion process, furthermore if this results in a simpler and easier to implement solution. .

Please replace paragraph [0026] with the following amended paragraph:

[0026] The present invention is directed to an assembly for use on a firearm, and more particularly, to a weapon usage detecting and tracking device [[adapted with the means and a method of signalization]] which may include provisions for activating signals [[that provides the user clear visual]] aimed to provide to the user with [[feedback and an homologous perception of]] perceivable reports regarding [[the progressive depletion of]] a weapon's ammunition load status.

Please replace paragraph [0030] with the following amended paragraph:

[0030] Internally included,[[is]] are a power source, a simple but condensed programmable controller [[counter]] circuit in sleep mode by default, and properly [[disposed]] adapted detecting means with optional signal conditioning supporting circuitry. Externally accessible is at least one programming and reset control [[button]] means, adapted to alter presets in said programmable controller, or to perform a reset operation.

Please replace paragraph [0031] with the following amended paragraph:

[0031] [[The detecting means is structured to report upon discharging a round, by induced dynamics or by the occurring change of position of said weapon slide portion, or by the combination of both, by deriving or generating, depending on the detecting component type in use, substantial amount of electricity to the tracking means as to activate it from a sleep mode, said tracking means, in order to perform a tracking operation. Said tracking means consequentially is adapted to report to the user by illuminating a corresponding indicator in accordance to a preprogrammed routine.]] The fundamental single detecting device preferred version is based on an adequately adapted piezoelectric detecting device generating a pulse pattern in correlation to the dynamically induced sequence of stresses occurring when said weapon is actuated.

Please add the following new paragraphs after paragraph [0031]:

[0031.1] An alternate form combines with a second slide home default position detecting component which in turn could be a switch that reports a slide breaking away from said home default position by either deriving electrical flow or interrupting a circuit. It can perform also as a programming level selecting device in the case of a highly compact installation. A piezoelectric component that generates an electrical pulse when departing or

returning to said home default position optionally can be used to act as a double certain detector for a last shot fired in combination an assembly that utilizes an inclination or tilt event detector.

[0031.2] Power conservation means include commonly used practices of activating and enabling tracking activity from a lower power sleep mode wait state upon the occurrence of an electrically detectable event, programmed furthermore to return to said sleep mode wait state upon completing an activity cycle. The assembly supports multiple signal and signal patterns with duty cycle controls for said signals, and real time firing events history recording options by means of proper software and hardware implementation.

Please replace paragraph [0032] with the following amended paragraph:

[0032] In this case, without this form being limiting of others possible, a per load depletion signaling system including a plurality of led devices is shown. In the case of an event recorder version, [[includes a]] non-volatile memory [[component]] and [[parasite digital]] real time clock [[provision]] provision adapted to the tracking structure, [[to]] provide time reference so that the controller can execute operations to store time and date information [[appended]] correlated to each tracked event in chronological succession into said memory component, thusly creating a data string representing the discharge history of said weapon that is retrievable at a further date.

Please replace paragraph [0033] with the following amended paragraph:

[0033] [[The event detecting is resolved by means of either a switching device or by a adequate component or components capable of detecting dynamics or a combination thereof.]] The event detecting is resolved by an adequately adapted piezoelectric detector which undergoes a sequence of stresses induced by the activity of a semiautomatic weapon upon the event of it being discharged, discharged and automatically reloaded or manually

operated. It generates electrical pulse sets containing spikes of varied magnitude occurring in specific moments during the duration of the said activity cycle, representing an electrical proportional equivalent to the physical magnitudes of force, acceleration, duration and are correlated in time with the dynamically tangible events that take place in the cycling to the particular weapon type in use. Each type of activity has certain dynamic characteristics and the succession of events that take place follow a certain logical order and moment in time related to the cycle typical to each type of weapon, which in turn becomes represented by its electrical equivalence as reported by the detector to the tracking means.

Please add the following new paragraphs after paragraph [0033]:

[0033.1] In the case of a round being discharged, typically, the very first portion of the cycle is conformed by the abrupt or instant rearward intense acceleration happening very briefly upon the projectile being propelled and exiting the barrel of the weapon, generating a first notable brief electrical pulse portion by this shock type stress induced in the detector.

[0033.2] An adequately adapted detector, will in this case report sharp spikes with quick decays and adapting a detector adequately may include aside from material choice, proper encasement, filtering and signal conditioning as to keep unwanted resonance reasonably low. In this way the decay of the detector is kept substantially prompt and closely trailing to the most relevant dynamic events that are taking place in close succession.

[0033.3] After the first shock type portion of the event, the recoil motion then follows, which is a constantly decelerating process in nature, and as in this example using a recoil operated type weapon, it is exclusively due to the recoil spring that compresses absorbing a good portion of the energy carried by the slide, until said slide reaches the bottom of the rear bound stroke.

[0033.4] During this rearward displacement, remnant vibration from the discharge event

tapers off and low level friction activity is present, which still clocked, but deemed irrelevant since the system is then seeking for the presence or absence of events that would occur in expected logical time windows of a particular weapon typical mechanical cycles.

[0033.5] When the rearward cycle portion approaches and reaches its end, another pulse segment occurs which is representative of this bottoming event, in which for an instant in time, the slide is stopped completely and then reverses its travel direction. This signal portion can be of much lower magnitude than the first discharge portion, and this is mostly related to the type of weapon and detector installation. In the case of a recoil handgun with a detector mounted on the slide, a stiff frame weapon reports a higher magnitude and tighter pattern opposite to a composite frame weapon. On some types of weapons of different design, more specifically those of the type that have an internally reciprocating bolt, a detector and the tracking system can be adapted to read this portion of the discharge event in the case in which this is more fitting for accurate tracking.

[0033.6] Providing there is another round available from the load, a reverse direction displacement automatically then takes place, and the slide portion of said weapon starts a return travel aided by the force of the slide spring, inducing as it travels also another set of pulses basically vibration induced by friction and other activity, like dragging a new round out of the clip. Even though clocked, these pulses could be disregarded or filtered off as it could be done for practical purposes. At the end of this displacement, the slide reaches the home position colliding at substantial speed with the supporting structure front limit as it is also urged to decelerate abruptly while chambering a new round, resting nested then in a fire ready state.

[0033.7] This collision and abruptly stopped motion combination induces substantial stress in the detecting means which in turn generates proportional electrical pulses of equivalent nature. This pulse portion is typically, only second in intensity to the one induced by the projectile being propelled outwardly and it takes place within an expected time frame, said

time frame substantially corresponds to what a typical cycle duration that a discharge and reload event will last in a particular weapon.

[0033.8] Variables like return spring tension, slide friction, magazine spring tension, powder charge and bullet weight among others, are variables that affect a weapon cycle duration somewhat, but there is still a time frame within an acceptable tolerance, repetitive enough as to be utilized as a predictable reference for implementing a reliable tracking means with programmed logic operators adapted for identifying events inherent to the operation of said weapon with sufficient certainty, by monitoring and tracking electrical pulse sequences generated by an adequately adapted piezoelectric detector setup.

[0033.9] The preferred embodiment of the current invention identifies and tracks relevant events by a process of selective discrimination of electrical pulses that conform the pulse pattern set of a weapon cycle, simply utilizing voltage comparison below threshold rejection, and tracking in time using logic relative to known event duration time windows correlated to said weapon known operation cycles, by identifying the presence or absence of a relevant portion of said pulse pattern in combination also with the detected event logical occurrence within to the load count tracking.

[0033.10] In the case of a last shot from a load being discharged, in modern weapons, the slide holds open in the rearward position, having induced as a result, only an incomplete segment of the pulse pattern when compared with a full cycle that includes the reload portion. As this was expected to take place in a time frame and was not present, the system determines then that this was a last round of the load by not only recognizing that a shot was fired, but also that the weapon was or not reloaded following the discharge, ascertaining that the shot fired is the last round of the load and tracking the event accordingly.

[0033.11] Also, due to the fact that it can track ammunition expenditure on a per load basis, the logical operators in place will identify the detectable dynamics of the loading of a first round of a new load as what it is, and not count it as a round discharged since it is expected after an acknowledged last shot fired of a load since the electrical pulse pattern that represents it, is only a portion of a discharge and reload full cycle.

[0033.12] Likewise, if an accidental dropping of the weapon on a hard surface occurs, this event has to induce stresses of an abruptness, magnitude and orientation enough in a properly adapted detector, otherwise it will not activate the system due to its sensitivity threshold. In the event like this was to occur while the weapon had a full clip as tracked by the load tracking logic, it will keep the count as default since this will appear to be the last shot of the clip or a manual release reload from the hold open position. Error control logic is built into the system such that if an event is detected of being typical of an isolated discharged round with no automatic reload, provisions are made to record the event in the firing log, but tagged as anomalous to the per load tracking, which may in turn be representative of either potential weapon malfunction or misuse, which could be true as sometimes weapons discharge and jam on the reload, or on the other hand from any malicious attempt to defeat the record by loading a single round after a full clip is spent. If a lower number of rounds than a preset load are used in a load, the last event will reset to default count for next clip simply by identifying a discharge with no following reload at any one point of the count this happened. If the weapon is dropped and discharges, the time window criteria will then track a shot fired. Any modern microcontroller properly set up can perform at such clock rate, that is capable of tracking, going to sleep and track again including making reports and enabling signals at a speed such that these events can be tracked and properly identified with ease. A more advanced adaptation including electronic components with multiple built in signal profiling capabilities as multiple programmable voltage comparators in combination with properly tuned detecting means, allow for more specific characterization of impulses in which the footprint of a discharge

could be independently identified by its fast rise and decay and its short duration.

[0033.13] The typical mechanical cycle timing regarding discharging a weapon is based on said weapon's rate of discharge if adapted to discharge in automatic mode. As an example if this rate would be 1200 rounds per minute, then a complete automatic cycle of discharge and reload independent of the human factor will take in said weapon approximately 1/20th of a second or approximately 50 milliseconds. The tracking system then for said type of weapon is adapted to track events that happen within this time frame on a per cycle basis, in which it would then be possible to ascertain that a round discharged was the last one of a load based on the fact that the last pulse portion typically generated at the completion of the reload portion of a complete cycle of discharge and reload of said weapon, didn't take place within the expected logical window of time that opened somewhat before and closed somewhat after said 50 milliseconds mechanical cycle duration time, this meaning that said cycle was interrupted. To match weapon type and design, other type of detecting and tracking patterns can be implemented, by properly adapting the detecting and tracking means to the dynamic event profile of the weapon.

[0033.14] A corrective reset to default control switch conveniently comes into play when the weapon has being utilized and handled in a different ways than intended, introducing error to the tracking means. Even though a manual reload cycle sets the count to default again and just by doing so, the user can reset the system to initial load count again, a switch can be used for the same purpose. These type of errors are related only to the per load count, but will not affect a net total rounds count tracked in the firing history, since these are based on truly compliant dynamic footprint with a discharge being detected and built in logic event discrimination.

[0033.15] Additional control switches can provide functionality and customization options to the user, and can be adapted as the particular design and application requires.

Please replace paragraph [0034] with the following amended paragraph:

[0034] In variations of the system, a [[A]] switching device [[is utilized]] could be used in combination for establishing that the slide has abandoned the home position or has returned. In a similar fashion as pictured on my prior patent #5,735,070 titled Illuminated Gun Sight and Low Ammunition Warning System For Firearms, in which a contact is established or broken upon the slide of the weapon arrives or departs from the home position, in this case, said [[Said]] switching device [[is]] could be of the normally closed or open type and is mounted on the assembly adequately disposed as to be urged into “off” or “on” mode whilst the slide is at the home position and said switching device detecting member is bearing in interference against a mating portion of the weapons frame. An adaptation of a film piezoelectric component that will produce a pulse on arriving to the home position could also be utilized to indicate the moment of return of the slide to the closed position.

Please replace paragraph [0035] with the following amended paragraph:

[0035] Another detecting combination would be using a normally open type switch in which upon said weapon is discharged, the slide displaces rearwards and away from said frame causing the switching device to close the circuit deriving as a consequence a sufficient amount of electricity from its power source to the tracking means as to activate it. The tracking means following its embedded instruction set utilizes its built in time tracking capabilities to identify this event.

Please replace paragraph [0036] with the following amended paragraph:

[0036] If the circuit is broken or remains conductive depending of the switch type set up thereafter in a time typical of the duration of a full discharge and re-chamber event, the tracking means will acknowledge such event has taken place and that there is another

round in place in the chamber of said weapon.

Please replace paragraph [0037] with the following amended paragraph:

[0037] If the switch remains conductive or if the circuit remains broken for more than the time it typically takes to complete a full discharge cycle including chambering a new round of ammunition, the tracking means identifies that said discharged round was the last round of the load since semiautomatic weapons will remain by design with the slide open in such a case not allowing said switch to break or close the circuit.

Please replace paragraph [0038] with the following amended paragraph:

[0038] [[~~The monitoring of the~~]] Monitoring in time the state of the switching component [[remains enabled]], still has further uses [[in this invention]].

Please replace paragraph [0050] with the following amended paragraph:

[0050] In the preferred embodiment of this invention, the total available rounds per load are divided into three stacks; each one corresponds to an alert level. A first amount, being at a level of first alert, a green light is [[pulsated]] enabled whilst discharging this stack. Once this stack is spent, as the second alert level, a blue indicator is [[pulsated]] enabled for each discharge of this stack. In this case a blue indicator as opposed to yellow one is used due to the fact that a yellow like color easily blends with a muzzle blast in twilight [[ef]] or dark. Following will be the last stack that will then be represented by a red light, which is the last and the immediate action-prompting signal.

Please delete all the following paragraphs [0054], [0055], [0056], [0057], [0058], [0059], [0060], [0061], [0062], [0063], [0064], and [0065]

Please replace paragraph [0070] with the following amended paragraph:

[0070] By detecting this abrupt angular motion with a properly disposed rotational or inclination sensor, a firing event of a weapon can be also identified.

Please replace paragraph [0071] with the following amended paragraph:

[0071] Expanding further into other option of the present embodiment, the detecting and the tracking means being adapted to report and positively identify a discharge event has certainly happened, serve also to prompt to record into memory provision these events in combination to a referential timetable provided by an appended real time clock and said memory provision. [[The]] In this embodiment, the clock device shown is of a [new] type of package, which includes an extremely small, built in crystal providing the functionality and the shock resistance in an extremely small footprint.

Please replace paragraph [0072] with the following amended paragraph:

[0072] Communication means are provided on the assembly as to allow access with a properly adapted external means to the data stored on said memory provision. The memory provision [[is]] could be conveniently adapted to record events in a successive manner such that when its storage capacity is reached, it will handle the next data input by overflowing and eliminating the oldest events previously stored. The memory storage access means [[component]] of choice in this embodiment is of the I²C serial type device. This allows operation with a minimal amount of connectivity and its streamlined protocol is sufficiently fast for this application.

Please add the following new paragraphs after paragraph [0098]:

[0098.1] Fig. 15 is a printout of data acquired from the dynamically induced set of pulses on a properly adapted piezoelectric detecting device during the complete cycle of discharge and reload of a composite frame pistol.

[0098.2] Fig 16 is a printout of data acquired from the same set up as above but is recorded from a discharge only with no reload.

[0098.3] Fig 17is a printout of data acquired from the same set up as above but recorded from reloading a round from a clip by releasing the slide from a hold open position, where the detent is released allowing the spring to propel the slide to return to home.

[0098.4] Fig 18 is a printout of data acquired also from the same set up as above but recorded from discharging the last three rounds from a load in relative close succession, where the clip was emptied and the slide was left open in a captive position.

Please replace paragraph [0101] with the following amended paragraph:

[0101] This [[button]] control switch is used mostly for resetting to the default count the system every time needed but also serves to alter the presets on the embedded program. As a reference, by pressing and holding this [[button]] control switch 6 for a first amount of time, a first level of programming becomes available to the user. When doing so, the device responds by reporting to the user by means of a special luminous pattern informing that certain parameter can be altered with the same switch like i.e. “adding to the total load count”. By pulsing said [[button]] control switch 5 consecutive times, 5 rounds have been added to the total count. When done with this process, by leaving it at rest for a duration and then pressing momentarily once more to return to default, another “press and hold” routine can be applied for a longer duration, the device then reports a different luminous pattern displayed and the controller opens another window of programmability which

could be “subtract from the total load” and so forth. By utilizing this method and in combination with a second switch, a state change is invoked on the first switch, doubling the windows of opportunities for altering the presets.

Please replace paragraph [0108] with the following amended paragraph:

[0108] Fig. 5 is a close-up view of the installation showing a version that includes a double [[button]] switch 30 and 28 for programming when the detecting means doesn't include a switching slide position detector that can perform as a control means. 6 is the weapon slide, 27 is the secure assembly and 29, shows the luminous indicator window.

Please add the following new paragraph after paragraph [0121]:

[0121.1] Fig 15 is a pulse set acquired from a firing and reload sequence from a composite frame recoil operated handgun in which 91 is the electrical portion resulting from the actual discharging of the round, 92 is the moment of inversion of the slide motion at the end of the recoil, and 92 is the collision of the slide against the forward limit stop of the return stroke.

[0121.2] Fig 16 is a pulse set acquired from firing a single and last round from a load in the same weapon in which segments 91 and 92 are present and 93 is not within the corresponding time grid.

[0121.2] Fig 17 is a pulse set acquired from releasing the slide from a hold open position where the slide spring is preloaded and said slide returns to home propelled by said spring as it drags and chambers a new round from a clip. Segment 93 is generated by the collision of the slide against the home stop.

[0121.3] Fig. 18 are a pulse sets generated by discharging on the same type of weapon, three rounds within a time frame <.7 seconds, where these rounds were the three last of a load. 91 and 93 are present in the first two pulse sets, but absent on the last one.